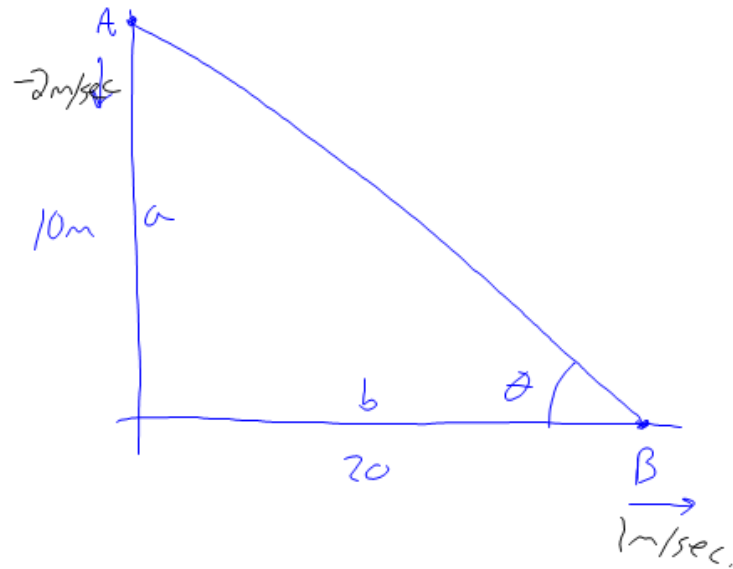


1022 mph



$$\tan \theta = \frac{a}{b}$$

$$\sec^2 \theta \frac{d\theta}{dt} = \frac{b \frac{da}{dt} - a \frac{db}{dt}}{b^2}$$

$$a = 10 \quad \frac{da}{dt} = -2 \text{ m/sec}$$

$$b = 20 \quad \frac{db}{dt} = 1 \text{ m/sec.}$$

$$\frac{\sec^2 \theta \frac{d\theta}{dt}}{\sec^2 \theta} = \frac{20(-2) - 10(1)}{(20)^2 \sec^2 \theta}$$

$$\theta = \tan^{-1}\left(\frac{10}{20}\right)$$

$$\sec^2 \theta = \sec^2\left(\tan^{-1}\left(\frac{10}{20}\right)\right) = 1.25$$

$$\frac{d\theta}{dt} = \frac{-50}{500} = -0.1 \text{ rad/sec.}$$

to degree
 $\approx 5.7^\circ$

27.

$$C(x) = 32x + 6000$$

$$r(x) = (200 - (x - 50)(2))x$$

$$= (200 - (2x - 100))x$$

$$= (300 - 2x)x$$

$$r(x) = -2x^2 + 300x$$

$$C'(x) = 32$$

$$r'(x) = -4x + 300$$

$$32 = -4x + 300$$

$$-306 \quad -300$$

$$\frac{-4x}{-4} = \frac{-268}{-4}$$

$$x = 67$$

$$\textcircled{21} \quad y = 4\cos\left(\frac{1}{2}x\right) \quad (-\pi, \pi)$$

$$A = 2xy$$

$$A = 2x \cdot 4\cos\left(\frac{1}{2}x\right)$$

$$A' = 2x\left(-4\sin\left(\frac{1}{2}x\right)\left(\frac{1}{2}\right)\right) + 4\cos\left(\frac{1}{2}x\right)(2)$$

$$0 = -4\sin\left(\frac{1}{2}x\right) + 8\cos 0.5x$$

$$x = 1.72, \cancel{6.85}$$

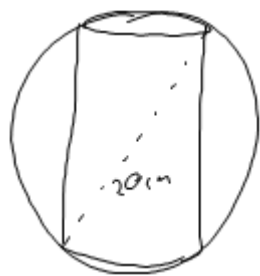
$$y = 4\cos(0.5 \cdot 1.72)$$

$$y = 2.6$$

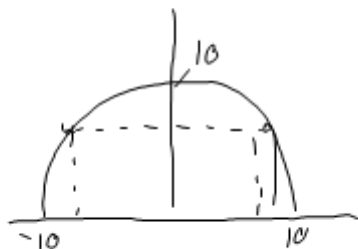
$$\text{dimensions: } 2.6 \times 3.44$$

$$\text{area: } 8.9775$$

(22)



10 cm



$$y = \sqrt{100 - x^2}$$

$$\text{Area} = 2xy \quad \text{Area} = 2x\sqrt{100 - x^2}$$

$$A' = [(2x)(-x/\sqrt{100 - x^2})] + [\sqrt{100 - x^2}(2)]$$

$$A' = -2x^2/\sqrt{100 - x^2} + 2\sqrt{100 - x^2}$$

$$-2\sqrt{100 - x^2} = -2x^2/\sqrt{100 - x^2}$$

$$-200 + 2x^2 = -2x^2$$

$$-200 = -4x^2$$

$$x^2 = 50$$

$$x = \sqrt{50} \Rightarrow 5\sqrt{2} \approx 7.07$$

not right



$$20^2 = h^2 + (2r)^2$$

$$20^2 - h^2 = 4r^2$$

$$\frac{20^2 - h^2}{4} = r^2$$

$$V = \pi r^2 h$$

$$V = \left(\frac{20^2 - h^2}{4} \right) h \pi$$

$$V = \frac{20^2 \pi h - h^3 \pi}{1}$$

$$V' = \frac{20^2 \pi - 3h^2 \pi}{1}$$

$$V' = 0$$

$$0 = \frac{20^2 \pi - 3h^2 \pi}{1}$$

$$0 = 20^2 \pi - 3h^2 \pi$$

$$0 = 20^2 - 3h^2$$

$$h \approx \pm 11.55$$

$$r = 8.16$$

$$V = 2416.08 \text{ units}^3$$

Ch. 4 Review

Must Do:

#42, 53, 62, 71, 72

Pick some

Linearization: #27-29, 39

Optimization: #45-57

Related Rates: #58-65